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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/453,831	12/02/1999	KENRO NAKAMURA	04329.2199	3119

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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT	PAPER NUMBER
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1765

17

DATE MAILED: 10/23/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/453,831	Applicant(s) NAKAMURA ET AL.	
	Examiner Lynette T. Umez-Eronini	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,5,11,12 and 17-22 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,5,11,12 and 17-22 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>15</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claim 1 and 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Westmoreland (US 6,143,192).

Westmoreland teaches removing all or a portion of a film, layer, or deposit, or other structure composed of ruthenium metal and/or ruthenium dioxide by contacting a region of a subsurface structure with ceric ammonium nitrate (column 3, lines 29-38). The ceric ammonium nitrate material, whether in solution form or otherwise, also may be used as an active chemical component of a slurry for planarizing a surface (column 5, lines 10-12). The material is applied to the surface and acts to remove ruthenium metal and/or ruthenium dioxide from the surface that is planarized (column 5, lines 13-16). Westmoreland's ceric ammonium nitrate solution is the same as applicant's polishing liquid containing cerium (IV) nitrate.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Westmoreland (US '192) as applied to claim 1 above, and further in view of Takikawa et al. (US 4,574,292).

Westmoreland differs only in failing to teach the Ru compound is SrRuO_3 , in claim 5.

Takikawa teaches a metal oxide film containing Ru and a metal M provides a very stable structure of RuSrO_3 (column 2, lines 39-45), which read on a Ru compound is SrRuO_3 .

Hence, it is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Westmoreland by using a Ru compound such as SrRuO_3 the purpose of improving the electrical properties of the device.

5. Claims 11 and 17-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Westmoreland (US '192).

Westmoreland teaches a planarizing (polishing) method that comprises:

removing ruthenium metal and/or ruthenium dioxide includes an amount of ceric ammonium nitrate, that may be in the form of a liquid etchant solution, and in one form, and, in one form, the solution may be an aqueous solution wherein ceric ammonium nitrate and, optionally, other solutes, are dissolved in liquid water (column 3, line 42-49),

which is the same as preparing a first polishing liquid containing tetravalent cerium ions or cerium (IV) nitrate in a first concentration wherein the ceric ammonium nitrate is the same as applicant's first polishing liquid; and

dissolving the 0.5-70 weight percent of ceric ammonium nitrate and, optionally, other solutes, in water and applying the ceric ammonium nitrate solution to a (Ru) surface (column 3, lines 55-57), reads on adding a solvent to said first polishing liquid to form a second polishing liquid containing tetravalent cerium ions in a second concentration lower than the first concentration; and

using the ceric ammonium nitrate whether in solution form or otherwise, also may be used as an active chemical component of a slurry used in a planarization process for planarizing a surface (column 5, lines 10-13; column 1, lines 37-41; and column 3, lines 66-67), which reads on,

polishing a surface of a substrate containing Ru or a Ru compound in a surface region with the second polishing liquid.

Westmoreland differs in failing to explicitly teach the addition of the solvent is carried out upon or immediately before the polishing of said substrate, **in claims 17 and 22.**

It is the examiner's position that since Westmoreland teaches a method of removing a ruthenium metal by contacting the metal with a polishing solution containing ceric ammonium nitrate, which is formed by dissolving 0.5-70 weight percent of ceric ammonium in water (same as applicant's first polishing liquid) to form a second solution, then using Westmoreland's solution to remove the same material as that of the claimed

invention would inherently meet the claim limitation of the addition of the solvent is carried out upon or immediately before the polishing of said substrate.

Hence, it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to add the solvent upon or immediately before the polishing of the said substrate for the purpose of using a fresh polishing liquid.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Westmoreland (US '192) as applied to claim 17, and further in view of Takikawa et al. (US 4,574,292).

Westmoreland differs only in failing to teach the Ru compound is SrRuO_3 , in claim 12.

Takikawa teaches a metal oxide film containing Ru and a metal M provides a very stable structure of RuSrO_3 (column 2, lines 39-45), which read on a Ru compound is SrRuO_3 .

Hence, it is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Westmoreland by using a Ru compound such as SrRuO_3 the purpose of improving the electrical properties of the device.

Conclusion

7. Applicant has argued that Figure 1 depicts Ru polishing rate as a function of time and the polishing rate decreases as time progresses. Applicant's argument is

unpersuasive. Figure 1 shows changes in polishing rate with respect to time after slurry preparation and not after preparation of the polishing liquid. The claimed invention is directed to a method of removing Ru using a polishing liquid and not a polishing slurry. Also the Specification discloses that FIG. 1 is a graph showing the change with time in the Ru polishing rate in the polishing with a polishing liquid containing 5% by weight of diammonium cerium (IV) nitrate, which was prepared by diluting with water an aqueous solution containing 20% by weight of diammonium cerium (IV) nitrate (page 7, lines 17). Would the polishing rate break down with time for concentrations of the liquid containing less than or more 5% by weight of diammonium cerium (IV) nitrate?

In order to be entitled to reconsideration of further examination, the applicant or patent owner must reply to the Office action. The reply by must be reduced to a writing which distinctly and specifically points out the supposed errors in the examiner's action and must reply to every ground of objection and rejection in the prior Office action. The reply must present arguments pointing out the specific distinctions believed to render the claims, including any newly presented claims, patentable over any applied references. If the reply is with respect to an application, a request may be made that objections or requirements as to form not necessary to further consideration of the claims be held in abeyance until allowable subject matter is indicated. The applicant's or patent owner's reply must appear throughout to be an *bona fide* attempt to advance the application or the reexamination proceeding to final action. A general allegation that the claims define a patentable invention without specifically pointing out how the language

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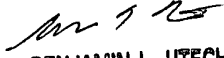
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of the claims patentably distinguishes them from the references does not comply with the requirements of this section.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-972-9310 for regular communications and 703-972-9311 for After Final communications.

ltue
October 21, 2002


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